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ACCIDENTS AT METALLURGICAL WORKS IN THE UNITED STATES

DURING THE CALENDAR YEAR 1915

COMPILED BY

ALBERT H. FAY

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ACCIDENTS AT METALLURGICAL WORKS IN THE UNITED STATES DURING THE CALENDAR YEAR 1915.

Compiled by ALBERT H. FAY.

INTRODUCTION.

This paper is the second report of the Bureau of Mines on accidents at metallurgical works, the first being for the calendar years 1913 and 1914.[a] The figures cover the returns from 110 smelting plants in 1915 as compared with 94 in 1914, and include copper, lead, and zinc, and quicksilver smelters, as well as refineries. The iron blast furnaces are not included in the figures given herein. The number of ore-dressing plants reporting in 1915 was 560 as compared with 484 in 1914 and 311 in 1913. These represent concentrating plants for copper, lead, and zinc ores, stamp mills, cyanide plants, and iron-ore washers. A larger number of operators reported for the year 1915 than did for 1914, as indicated above. The total number of men reported employed in the metallurgical plants, both smelters and ore-dressing plants, was 49,891 as compared with 41,461 in 1914.

The number of fatalities reported at metallurgical plants was 68—30 at ore-dressing plants and 38 at smelters. The number of nonfatal injuries reported at ore-dressing plants was 2,095 and at smelters 5,718. Of the injuries reported 3 were permanent total disabilities, 1 at ore-dressing plants and 2 at smelters. There were 63 permanent partial disabilities at ore-dressing plants and 87 at smelters.

The fatality and injury rates for 1915 compared with previous years are given in Table 11. The nonfatal injury rate at smelters was 182.53 per 1,000 as compared with 203.12 in 1914. The nonfatal injury rate at ore-dressing plants was 112.85 per 1,000 in 1915, 96.71 in 1914, and 131.93 per 1,000 in 1913.

Summary of labor and accidents at metallurgical works.

	Men employed.	Day's work performed (shifts).	Number killed.	Number injured.
Ore dressing plants:				
1913	14,985	4,846,338	16	1,977
1914	15,128	4,567,529	23	1,434
1915	18,564	5,732,184	30	2,095
Smelters: [b]				
1913	20,564	7,292,766	47	4,247
1914	27,879	9,700,769	33	5,673
1915	31,327	10,878,486	38	5,718

[a] Fay, A. H., Accidents at metallurgical works in the United States during the calendar years 1913 and 1914: Tech. Paper 124, Bureau of Mines, 1915, 28 pp.

[b] Exclusive of the iron and steel industry.

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ACKNOWLEDGMENTS.

The data presented in this paper were voluntarily supplied by the officials and managers of the metallurgical companies at the request of the bureau, there being no law compelling such companies to render a report. The bureau gratefully acknowledges the hearty cooperation of the many officials who have answered its inquiries, and invites suggestions whereby the annual report of accidents at metallurgical plants may be improved so as to best serve the industry.

SERIOUS AND SLIGHT INJURIES.

The definition of an accident, which is of fundamental importance, is not uniform in the various States. Some States require all accidents to be reported, whereas others require reports on a 7-day, a 14-day, or even a 30-day disability basis. One operator may require a detailed report of any casualty, however slight, that delays the worker, or that draws blood; another may not consider an accident worthy of record that does not come to the attention of the foreman or shift boss. The bureau's requests call for all injuries causing more than one day's disability. The injuries are then classified as serious and slight.

SERIOUS INJURY.

A serious injury is considered in this report as one that results in a disability of more than 14 days. This class includes such injuries as broken arm or leg, loss of eye, and a severe cut or bruise.

SLIGHT INJURY.

A slight injury is considered as one that involves a loss of time of more than 1 day but not more than 14 days. Under this class may be placed such injuries as cuts, sprains, mashed fingers, bruises, dirt in eye, and slight burns. Of course any slight injury may become infected, and thus result in a serious accident as defined above.

CLASSIFICATION OF INJURIES FOR 1916.

Many of the States now have compensation laws, and in order to conform with their classifications the bureau's classification of serious and slight injuries for 1916 will be on a 14-day (2-weeks) basis, the same as for 1915.

The classification of injuries includes three groups as follows:

1. Fatal.
2. Serious (time lost, more than 14 days):
   - (*a*) Permanent disability.
     - Total.
     - Partial.
   - (*b*) Others.
3. Slight (time lost, 1 to 14 days, inclusive).

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ACCIDENTS AT ORE-DRESSING PLANTS.

The number killed in the ore-dressing plants in 1915 was 30, or 1.62 per 1,000 employed, as compared with 23 in 1914, when the fatality rate was 1.59 per 1,000 employed. The injuries in 1915 were 420 serious and 1,675 slight.

Table 1 shows the number of employees by States, the number of days' work performed, together with the number killed and injured, with fatality and injury rates calculated for each State. Tables 2 to 4 show the number killed and injured at ore-dressing plants, classified by causes and States, during the calendar year 1915.

Table 5 is a summary of the accidents by causes and by States for the years 1913, 1914, and 1915. Table 6 contains revised figures for 1914, and therefore supersedes Table 12 in Technical Paper 124.

ACCIDENTS AT SMELTERS.

In 1915 the number of men killed at smelting plants was 38, or 1.21 per 1,000 men employed, as compared with 1.19 per 1,000 in 1914. There were reported 1,493 serious injuries, or 47.66 per 1,000 employed. The number of slight injuries reported in 1915 was 4,225, or 134.87 per 1,000 employed. Table 11 presents a summary of accidents at smelting plants, by causes and by States, showing the number killed and injured during the calendar years 1913, 1914, and 1915. At the bottom of the table comparative fatality and injury ratios at ore-dressing plants, coke ovens, quarries, and metal mines are given.

Table 7 shows the number of men employed and the number of days worked at smelters by States for the year 1915. It also shows the total number killed and injured, with fatality and injury ratios for each State. Tables 8 to 10 show fatalities and injuries by causes and States for 1915.

CAUSES OF ACCIDENTS.

The percentage of accidents due to any one cause is given in the following table:

Accidents at ore-dressing and smelting plants in the United States, classified by principal causes, during 1915.

Cause.	Ore-dressing plants.				Smelting plants.			
	Killed.		Injured.		Killed.		Injured.	
	Total.	Per cent.	Total.	Per cent.	Total.	Per cent.	Total.	Per cent.
Haulage	5	16.67	123	5.87	12	31.58	590	10.32
Machinery	12	40.00	487	23.25	7	18.42	348	6.09
Falls of persons	6	20.00	249	11.89	3	7.90	499	8.73
Suffocation in ore bins	3	10.00	3	.14	1	2.63	8	.14
Flying or falling objects	.....	.....	192	9.17	1	2.63	914	15.98
Electricity	3	10.00	38	1.81	4	10.53	46	.80
Hand tools	.....	.....	235	11.22	.....	.....	633	11.07
Nails, splinters, etc	.....	.....	131	6.25	.....	.....	146	2.55
Burns (water, steam, gas, matte, slag)	.....	.....	12	.57	8	21.05	1,008	17.63
Other causes	1	3.33	625	29.83	2	5.26	1,526	26.69
Total	30	100.00	2,095	100.00	38	100.00	5,718	100.00

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In the ore-dressing plants machinery was responsible for 40 per cent of all fatalities, and 23.25 per cent of all injuries. Similar figures for smelting plants are much smaller, for the reason that there is more machinery in use in ore-dressing plants than at smelters, and the men are usually in closer contact with the machinery, as, for example, at jigs, tables, stamps, rolls, and crushers. There are many revolving shafts, a large number of which have projecting keys, moving belts, wheels, and cams within the reach of the operator. The machinery at smelting plants is usually confined to the power house, where the blowers, engines, and dynamos are placed, and to overhead cranes, almost all of which are entirely out of the reach of the regular smelter employees.

Twenty per cent of the fatalities at ore-dressing plants were due to falls of persons, whereas at the smelters the fatalities due to falls of persons represent 7.90 per cent of the total. Fatalities due to flying or falling objects represent 2.63 per cent at smelters and none at ore-dressing plants.

Haulage systems caused 31.58 per cent of the fatalities at smelting plants, and about half this percentage at ore-dressing plants. The difference is largely due to the type of material handled and to the larger number of cars in operation around smelter yards than at ore-dressing plants. In many ore-dressing plants the ore is brought to the bins in railroad cars or aerial trams, and often there is no other haulage system in connection with the plants, the tailings usually being disposed of by launders or flumes, whereas at smelting plants the molten slag is usually handled in slag cars and the bullion has to be handled on trucks.

At smelting plants burns from hot metal, slag, etc., claimed 21.05 per cent of the fatalities and 17.63 per cent of the nonfatal injuries.

The tables presented herein call attention to the principal causes of accidents at these works and should serve as guides for the safety engineer to show where it will be possible for him to do his work most efficiently and to accomplish the best results.

STATISTICAL TABLES.

The tables showing the classification and the number of accidents at metallurgical works in the United States during the calendar year 1915 follow:

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TABLE 1.—*Number of men employed, number of days worked, and number of men killed and injured at* **ore-dressing plants** *in the United States, in the calendar year* **1915.**

State.	Number of employees.	Total days worked.	Average days active.	Number killed.		Number seriously injured.[a]		Number slightly injured.[b]		Widows.	Orphans.
				Total.	Per 1,000 employed.	Total.	Per 1,000 employed.	Total.	Per 1,000 employed.		
Alabama	57	5,572	98	1	17.54	.....	.....	6	105.26	.....	.....
Alaska	520	159,078	306	.....	.....	22	42.31	51	98.08	.....	.....
Arizona	1,776	551,719	311	1	.56	91	51.24	259	145.83	1	2
Arkansas	89	22,400	252	.....	.....	1	11.24	1	11.24	.....	.....
California	766	243,708	318	2	2.61	19	24.80	72	93.99	.....	.....
Colorado	1,219	365,678	300	7	5.74	28	22.97	125	102.54	2	5
Florida	75	18,410	245	.....	.....	.....	.....	1	13.33	.....	.....
Georgia	57	14,540	255	.....	.....	.....	.....	3	52.63	.....	.....
Idaho	470	131,352	279	1	2.13	8	17.02	47	100.00	.....	.....
Kansas	114	25,584	224	.....	.....	.....	.....	2	17.54	.....	.....
Michigan	2,354	721,634	307	.....	.....	39	16.57	73	31.01	.....	.....
Minnesota	241	48,385	201	.....	.....	4	16.60	18	74.69	.....	.....
Missouri	1,462	394,850	270	2	1.37	15	10.26	140	95.76	1	5
Montana	2,451	796,575	325	5	2.04	47	19.18	245	99.96	.....	.....
Nevada	1,401	462,322	330	4	2.86	42	29.98	105	74.95	.....	.....
New Jersey	562	182,230	324	1	1.78	9	16.01	17	30.25	1	1
New Mexico	762	263,494	346	2	2.62	19	24.93	112	146.98	.....	.....
New York	370	104,382	282	1	2.70	4	10.81	34	91.89	.....	.....
North Carolina	94	18,265	194	.....	.....	.....	.....	4	42.55	.....	.....
Oklahoma	113	26,397	234	.....	.....	.....	.....	3	26.55	.....	.....
Oregon	69	16,879	245	.....	.....	4	57.97	7	101.45	.....	.....
South Dakota	395	138,182	350	.....	.....	6	15.19	27	68.35	.....	.....
Tennessee	328	79,091	241	.....	.....	5	15.24	22	67.07	.....	.....
Utah	1,664	601,358	361	2	1.20	39	23.44	224	134.62	.....	.....
Vermont	131	36,822	281	.....	.....	2	15.27	1	7.63	.....	.....
Virginia	488	153,397	314	1	2.05	4	8.20	31	63.52	.....	.....
Wisconsin	254	80,296	316	.....	.....	11	43.31	40	157.48	.....	.....
Other States[c]	282	69,584	247	.....	.....	1	3.54	5	17.73	.....	.....
Total, 1915	**18,564**	**5,732,184**	**309**	**30**	**1.62**	**420**	**22.62**	**1,675**	**90.23**	**5**	**13**

[a] Time lost, more than 14 days.
[b] Time lost, 1 to 14 days.
[c] Includes Connecticut, Delaware, Illinois, Iowa, Kentucky, Maine, Maryland, Pennsylvania, South Carolina, Washington, and Wyoming.

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TABLE 2.—*Number of men* ***killed*** *at* ***ore-dressing plants*** *in the United States, by causes, in the calendar year* ***1915.***

State.	Haulage system (cars, motors, etc.).	Railway cars or locomotives.	Crushers.	Rolls or stamps.	Tables, jigs, etc.	Other machinery.	Falls of persons.	Suffocation in ore bins.	Falling objects (rocks, timbers, etc.).	Cyanide or other poisoning.	Scalding (steam or water).	Electricity.	Hand tools.	Nails, splinters, etc.	Flying pieces of rock from sledging or crusher.	Other causes.	Total.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Alabama		1															1
Alaska																	0
Arizona								1									1
Arkansas																	0
California						1	1										2
Colorado	2	1		2			1					1					7
Florida																	0
Georgia																	0
Idaho						1											1
Kansas																	0
Michigan																	0
Minnesota																	0
Missouri						2											2
Montana			1			1	2					1					5
Nevada	1					1	1					1					4
New Jersey						1											1
New Mexico			1					1									2
New York								1									1
North Carolina																	0
Oklahoma																	0
Oregon																	0
South Dakota																	0
Tennessee																	0
Utah							1									1	2
Vermont																	0
Virginia			1														1
Wisconsin																	0
Other States [a]																	0
Total	**3**	**2**	**3**	**2**		**7**	**6**	**3**				**3**				**1**	**30**

[a] See footnote c, Table 1.

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TABLE 3.—*Number of men* ***seriously injured*** *at* ***ore-dressing plants*** *in the United States, by causes, in the calendar year* ***1915.***

State.	Haulage system (cars, motors, etc.).	Railway cars or locomotives.	Crushers.	Rolls or stamps.	Tables, jigs, etc.	Other machinery.	Falls of persons.	Suffocation in ore bins.	Falling objects (rocks, timbers, etc.).	Cyanide or other poisoning.	Scalding (steam or water).	Electricity.	Hand tools.	Nails, splinters, etc.	Flying pieces of rock from sledging or crusher.	Other causes.	Total.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Alabama																	0
Alaska	3		2	6	2	5	1						2		1		22
Arizona	1		2	1	1	18	15		7	1	1	4	5	3		32	91
Arkansas																1	1
California	1			2	1	3	4		2	1			1	1		3	19
Colorado	3		1	3	1	6	2		1			1	4		2	4	28
Florida																	0
Georgia																	0
Idaho	1					1	2									4	8
Kansas																	0
Michigan		2			1	8	9		3	1			5		1	9	39
Minnesota					1				1				1	1			4
Missouri	2		2			6	1						1			3	15
Montana	4		6		1	7	9		2			3	1		3	11	47
Nevada	1		2	3	2	10	5		2	5	1		3	1	3	4	42
New Jersey						2	1		1						1	4	9
New Mexico						5	4		2	1		2				5	19
New York		1	1			1	1										4
North Carolina																	0
Oklahoma																	0
Oregon				2	1											1	4
South Dakota				2			1						2			1	6
Tennessee		1					1						2	1			5
Utah	7	2	1		7	2	3		5				3		3	6	39
Vermont						1	1										2
Virginia	1					1	1									1	4
Wisconsin	1				1	1	3		3						1	1	11
Other States [a]															1		1
Total	25	6	17	19	19	77	64		29	9	2	10	30	7	16	90	420

[a] See footnote [c], Table 1.

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TABLE 4.—*Number of men* ***slightly injured*** *at* ***ore-dressing plants*** *in the United States, by causes, in the calendar year* ***1915.***

State.	Haulage system (cars, motors, etc.).	Railway cars or locomotives.	Crushers.	Rolls or stamps.	Tables, jigs, etc.	Other machinery.	Falls of persons.	Suffocation in ore bins.	Falling objects (rocks, timbers, etc.).	Cyanide or other poisoning.	Scalding (steam or water).	Electricity.	Hand tools.	Nails, splinters, etc.	Flying pieces of rock from sledging or crusher.	Other causes.	Total.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Alabama		3				2	1										6
Alaska	9		2	4	3	6	4			1		3	10	1		8	51
Arizona	8		2	1	5	49	37		20	3	2	4	31	13	1	83	259
Arkansas					1												1
California	2		5	8	2	9	3		4		1	1	14	9	2	12	72
Colorado	6	1	2	4	1	6	27		16			1	15	7	4	35	125
Florida								1									1
Georgia							2							1			3
Idaho	2		3		1	12	3		3				6	2	4	11	47
Kansas							1		1								2
Michigan					2	5	13		9	2			13	3	2	24	73
Minnesota							2		3				5	2	1	5	18
Missouri			2	2	2	33	7		5			2	3	15	8	61	140
Montana	9		30		1	53	25		17	1		3	29	12	18	47	245
Nevada	3		4	3		13	13		9	7		5	13	6		29	105
New Jersey		1				2	4		1				1		1	7	17
New Mexico	2					2	12		13		2	4	20	7		50	112
New York	5		1		2	3	1	2	5				4	6		5	34
North Carolina				1												3	4
Oklahoma	1														1	1	3
Oregon														6		1	7
South Dakota	1			5			3		1			1	6	1	3	6	27
Tennessee	2					6	2		7				3			2	22
Utah	24	5	2	7	16	12	23		34		3	4	25	24	13	32	224
Vermont						1											1
Virginia	1	1				2			10		1		5	4		7	31
Wisconsin	6		4		3	6	2		5				2	3	2	7	40
Other States [a]				1	1						1			2			5
Total	**81**	**11**	**57**	**36**	**40**	**222**	**185**	**3**	**163**	**14**	**10**	**28**	**205**	**124**	**60**	**436**	**1,675**

[a] See footnote [c], Table 1.

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TABLE 5.—*Summary of accidents at* ***ore-dressing plants*** *in the United States,* ***1913, 1914,*** *and* ***1915.***

	Killed.			Injured.		
	1913	1914	1915	1913	1914	1915
Accidents by causes:						
Haulage system (cars, motors, etc.)	1	.....	3	98	79	106
Railway cars or locomotives	1	3	2	34	38	17
Crushers	.....	.....	3	33	23	74
Rolls or stamps	.....	2	2	31	41	55
Tables, jigs, etc	.....	.....	.....	65	46	59
Other machinery	2	6	7	219	170	299
Falls of persons	3	3	6	238	205	249
Suffocation in ore bins	1	2	3	.....	2	3
Falling objects (rocks, timbers, etc.)	3	3	.....	367	222	192
Cyanide or other poisoning	1	.....	.....	8	9	23
Scalding (steam or water)	.....	.....	.....	24	9	12
Electricity	1	2	3	21	30	38
Hand tools	.....	.....	.....	199	133	235
Nails, splinters, etc	.....	.....	.....	74	78	131
Flying pieces of rock from sledging or crusher	.....	.....	.....	132	50	76
Other causes	3	2	1	434	299	526
Total number killed or injured	**16**	**23**	**30**	**1,977**	**1,434**	**2,095**
Accidents by States:						
Alabama	.....	.....	1	16	1	6
Alaska	(a)	1	.....	(a)	30	73
Arizona	4	5	1	335	287	350
California	.....	1	2	36	111	91
Colorado	5	2	7	127	103	153
Idaho	1	1	1	30	19	55
Illinois	.....	.....	.....	34	3	3
Michigan	.....	1	.....	25	51	112
Missouri	1	2	2	209	180	155
Montana	1	4	5	189	121	292
Nevada	.....	2	4	83	83	147
New Jersey	.....	.....	1	29	27	26
New Mexico	1	.....	2	111	95	131
New York	.....	.....	1	.....	12	38
Oklahoma	.....	.....	.....	11	35	3
Oregon	.....	.....	.....	3	5	11
South Dakota	.....	.....	.....	34	10	33
Tennessee	.....	.....	.....	13	1	27
Texas	.....	.....	.....	.....	7	.....
Utah	2	4	2	531	211	263
Virginia	.....	.....	1	20	5	35
Washington	.....	.....	.....	.....	.....	.....
Wisconsin	.....	.....	.....	68	16	51
Other States	1	.....	.....	73	21	40
Total number killed or injured	**16**	**23**	**30**	**1,977**	**1,434**	**2,095**

a Not reported.

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TABLE 6.—*Number of men employed, number of days worked, and number of men killed and injured at* **ore-dressing plants** *in the United States, in the calendar year* **1914.**

State.	Number of employees.	Total days worked.	Average days active.	Number killed.		Number seriously injured.[a]		Number slightly injured.[b]		Widows.	Orphans.
				Total.	Per 1,000 employed.	Total.	Per 1,000 employed.	Total.	Per 1,000 employed.		
Alabama	100	17,250	173	.....	.....	.....	.....	1	10.00	.....	.....
Alaska	225	76,046	338	1	4.44	3	13.33	27	120.00	1	.....
Arizona	1,314	437,061	333	5	3.81	58	44.14	229	174.28	1	4
California	581	153,471	264	1	1.72	17	29.26	94	161.79	1	2
Colorado	960	292,491	305	2	2.08	17	17.71	86	89.58	2	.....
Idaho	441	116,527	264	1	2.27	5	11.34	14	31.75	1	.....
Illinois	164	36,325	221	.....	.....	2	12.20	1	6.10	.....	.....
Michigan	1,761	493,875	280	1	.57	25	14.20	26	14.76	1	.....
Missouri	1,466	401,615	274	2	1.36	12	8.19	168	114.60	2	3
Montana	1,709	517,458	303	4	2.34	20	11.70	101	59.10	1	.....
Nevada	1,396	457,581	328	2	1.43	18	12.89	65	46.56	1	.....
New Jersey	440	135,312	308	.....	.....	5	11.36	22	50.00	.....	.....
New Mexico	741	235,843	318	.....	.....	8	10.80	87	117.41	.....	.....
New York	145	31,151	215	.....	.....	4	27.59	8	55.17	.....	.....
Oklahoma	404	118,217	293	.....	.....	4	9.90	31	76.73	.....	.....
Oregon	142	33,960	239	.....	.....	1	7.04	4	28.17	.....	.....
South Dakota	358	129,410	361	.....	.....	4	11.17	6	16.76	.....	.....
Tennessee	87	27,131	312	.....	.....	.....	.....	1	11.49	.....	.....
Texas	57	18,465	324	.....	.....	1	17.54	6	105.26	.....	.....
Utah	2,054	719,243	350	4	1.95	16	7.79	195	94.94	1	.....
Virginia	100	24,330	243	.....	.....	1	10.00	4	40.00	.....	.....
Washington	18	3,520	196	.....	.....	.....	.....	.....	.....	.....	.....
Wisconsin	175	39,624	226	.....	.....	.....	.....	16	91.43	.....	.....
Other States[c]	290	51,623	178	.....	.....	2	6.90	19	65.52	.....	.....
Total, 1914	**15,128**	**4,567,529**	**302**	**23**	**1.52**	**223**	**14.74**	**1,211**	**81.97**	**12**	**9**

[a] Time lost, 20 days or more.
[b] Time lost, 1 to 19 days.
[c] Includes Arkansas, Georgia, Iowa, Kansas, Massachusetts, Minnesota, North Carolina, South Carolina, and Wyoming.

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TABLE 7.—*Number of men employed, number of days worked, and number of men killed and injured at* ***smelting plants*** *in the United States, in the calendar year* ***1915.***

State.	Number of employees.	Total days worked.	Average days active.	Number killed.		Number seriously injured.[a]		Number slightly injured.[b]		Widows.	Orphans.
				Total.	Per 1,000 employed.	Total.	Per 1,000 employed.	Total.	Per 1,000 employed.		
Arizona	2,813	910,120	324	7	2.49	182	64.70	392	139.35	3	4
California	1,050	371,847	354	.....	.....	40	38.10	123	117.14	.....	.....
Colorado	2,327	839,587	361	6	2.58	156	67.04	248	106.57	2	2
Illinois	3,467	1,247,660	360	2	.58	172	49.61	610	175.94	.....	.....
Kansas	2,584	736,108	285	1	.39	82	31.73	326	126.16	1	2
Michigan	724	224,250	310	.....	.....	26	35.91	61	84.25	.....	.....
Missouri	1,155	400,689	347	3	2.60	28	24.24	276	238.96	1	3
Montana	3,344	1,200,496	359	6	1.79	112	33.49	345	103.17	4	17
Nevada	722	259,972	360	.....	.....	14	19.39	44	60.94	.....	.....
New Jersey	4,116	1,487,345	361	4	.97	189	45.92	441	107.14	4	8
Oklahoma	1,679	612,835	365	1	.60	63	37.52	199	118.52	.....	.....
Pennsylvania	2,015	661,376	328	2	.99	47	23.33	292	144.91	1	1
Texas	919	335,435	365	.....	.....	51	55.50	215	33.95	.....	.....
Utah	2,198	802,270	365	3	1.36	141	64.15	296	134.67	.....	.....
Washington	865	315,725	365	1	1.16	71	82.08	62	71.68	1	.....
West Virginia	834	304,368	365	1	1.20	53	63.55	53	63.55	.....	.....
Other States[c]	515	168,403	327	1	1.94	66	128.16	242	469.90	1	.....
Total, 1915	**31,327**	**10,878,486**	**347**	**38**	**1.21**	**1,493**	**47.66**	**4,225**	**134.87**	**18**	**37**

[a] Time lost, more than 14 days. [b] Time lost, 1 to 14 days. [c] Includes Indiana, New Mexico, Ohio, Oregon, Tennessee, Virginia, and Wisconsin.

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TABLE 8.—*Number of men* ***killed*** *at* ***smelting plants*** *in the United States, by causes, in the calendar year* ***1915.***

State.	Haulage system (cars, motors, etc.).	Railway cars or locomotives.	Crushers.	Cranes.	Blowers.	Other machinery.	Falls of persons.	Suffocation in ore bins.	Flying or falling objects (rocks, timbers, etc.).	Gas (burning or asphyxiation.	Scalding (steam or water).	Electricity.	Hand tools.	Nails, splinters, etc.	Furnace slips.	Burns from matte, slag, or molten metal (pouring or spilling).	Hot-metal explosions.	Other causes.	Total.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
Arizona	2					2	1	1								1			7
California																			0
Colorado	2	1								3									6
Illinois						1						1							2
Kansas			1																1
Michigan																			0
Missouri	1						1					1							3
Montana	1			1					1			1				1	1		6
Nevada																			0
New Jersey	1			1							1					1			4
Oklahoma																		1	1
Pennsylvania	1					1													2
Tennesse	1																		1
Texas																			0
Utah	1	1										1							3
Washington							1												1
West Virginia											1								1
Other States [a]																			0
Total	10	2	1	2	.....	4	3	1	1	3	2	4	.....	.....	.....	3	1	1	38

[a] See footnote [c] of Table 7.

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TABLE 9.—*Number of men* ***seriously injured*** *at* ***smelting plants*** *in the United States, by causes, in the calendar year* ***1915.***

State.	Haulage system (cars, motors, etc.).	Railway cars or locomotives.	Crushers.	Cranes.	Blowers.	Other machinery.	Falls of persons.	Suffocation in ore bins.	Flying or falling objects (rocks, timbers, etc.).	Gas (burning or asphyxiation).	Scalding (steam or water).	Electricity.	Hand tools.	Nails, splinters, etc.	Furnace slips.	Burns from matte, slag, or molten metal (pouring or spilling).	Hot-metal explosions.	Other causes.	Total.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
Arizona	17	.....	1	5	.....	18	18	.....	22	2	3	3	18	.....	1	32	8	34	182
California	8	1	.....	.....	.....	3	4	.....	6	.....	.....	.....	3	1	.....	6	6	2	40
Colorado	32	.....	.....	1	.....	11	19	.....	29	2	.....	.....	10	1	2	26	4	19	156
Illinois	17	3	.....	.....	.....	9	19	.....	13	7	.....	.....	15	6	.....	41	4	38	172
Kansas	12	.....	2	.....	.....	7	7	.....	4	.....	.....	.....	6	1	5	24	4	10	82
Michigan	1	.....	.....	.....	.....	1	4	.....	.....	.....	.....	.....	3	.....	.....	1	.....	16	26
Missouri	1	.....	.....	.....	2	.....	5	.....	5	.....	.....	.....	2	.....	.....	7	.....	6	28
Montana	11	3	.....	2	.....	8	22	2	21	.....	2	3	3	2	.....	19	3	11	112
Nevada	.....	4	.....	.....	.....	3	1	.....	3	1	2	.....	.....	.....	.....	.....	.....	.....	14
New Jersey	25	1	1	13	1	8	16	.....	38	.....	4	.....	19	.....	.....	33	5	25	189
Oklahoma	4	.....	.....	.....	.....	7	5	.....	8	1	.....	1	3	.....	4	17	7	6	63
Pennsylvania	2	1	.....	1	.....	2	4	.....	4	.....	1	.....	3	4	.....	10	2	13	47
Tennessee	7	.....	.....	.....	.....	3	.....	.....	9	.....	.....	.....	3	.....	.....	12	.....	14	48
Texas	17	2	.....	.....	.....	3	4	.....	10	.....	.....	.....	3	.....	.....	7	3	2	51
Utah	13	7	2	3	.....	7	15	.....	22	.....	1	1	9	.....	.....	39	3	19	141
Washington	7	2	1	1	.....	5	11	.....	19	.....	1	1	11	.....	.....	2	1	9	71
West Virginia	1	.....	.....	.....	.....	2	3	.....	.....	.....	.....	.....	.....	.....	.....	35	1	11	53
Other States [a]	.....	.....	.....	.....	.....	.....	1	.....	1	.....	.....	.....	1	.....	.....	8	.....	7	18
Total	**175**	**24**	**7**	**26**	**3**	**97**	**158**	**2**	**214**	**13**	**14**	**9**	**112**	**15**	**12**	**319**	**51**	**242**	**1,493**

[a] See footnote [c] of Table 7.

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TABLE 10.—*Number of men* ***slightly injured*** *at* ***smelting plants*** *in the United States, by causes, in the calendar year* ***1915.***

State.	Haulage system (cars, motors, etc.).	Railway cars or locomotives.	Crushers.	Cranes.	Blowers.	Other machinery.	Falls of persons.	Suffocation in ore bins.	Flying or falling objects (rocks, timbers, etc.).	Gas (burning or asphyxiation).	Scalding (steam or water).	Electricity.	Hand tools.	Nails, splinters, etc.	Furnace slips.	Burns from matte, slag, or molten metal (pouring or spilling).	Hot-metal explosions.	Other causes.	Total.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
Arizona	35	.....	.....	6	.....	26	35	.....	53	.....	2	10	77	6	.....	56	9	77	**392**
California	13	1	.....	1	.....	2	16	.....	23	2	1	1	14	4	.....	13	4	28	**123**
Colorado	33	3	2	.....	.....	7	24	1	39	1	3	1	29	7	8	37	7	46	**248**
Illinois	46	6	2	2	1	35	35	.....	60	28	8	1	66	28	7	88	6	191	**610**
Kansas	38	2	3	.....	.....	12	19	.....	38	2	1	.....	39	10	2	79	2	79	**326**
Michigan	3	.....	.....	.....	.....	2	6	.....	.....	.....	.....	.....	6	1	.....	.....	.....	43	**61**
Missouri	7	2	1	.....	.....	1	24	.....	39	.....	1	.....	18	2	.....	22	25	134	**276**
Montana	28	1	.....	1	.....	14	42	5	80	1	3	2	47	22	.....	21	12	66	**345**
Nevada	3	2	.....	.....	.....	2	5	.....	12	.....	2	2	3	4	.....	3	1	5	**44**
New Jersey	44	8	.....	16	.....	19	27	.....	94	6	3	3	47	13	.....	34	11	116	**441**
Oklahoma	3	.....	2	.....	.....	9	13	.....	26	2	.....	.....	24	8	.....	48	17	47	**199**
Pennsylvania	31	1	.....	.....	.....	10	16	.....	24	12	4	.....	50	5	.....	62	2	75	**292**
Tennessee	20	2	.....	.....	.....	4	10	.....	34	.....	.....	4	23	5	.....	32	6	61	**201**
Texas	30	5	.....	.....	.....	9	29	.....	60	.....	.....	1	23	3	.....	13	1	41	**215**
Utah	13	4	2	5	.....	10	33	.....	88	1	3	11	45	7	.....	42	2	30	**296**
Washington	2	.....	.....	1	.....	6	2	.....	26	.....	.....	.....	8	3	.....	1	4	9	**62**
West Virginia	1	.....	.....	.....	.....	2	4	.....	.....	.....	.....	1	.....	2	.....	16	.....	27	**53**
Other States [a]	4	.....	.....	.....	.....	.....	1	.....	4	.....	1	.....	2	1	.....	8	.....	20	**41**
Total	**354**	**37**	**12**	**32**	**1**	**170**	**341**	**6**	**700**	**55**	**32**	**37**	**521**	**131**	**17**	**575**	**109**	**1,095**	**4,225**

[a] See footnote [c] of Table 7.

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TABLE 11.—*Summary of accidents at* ***smelting plants*** *in the United States,* ***1913, 1914,*** *and* ***1915.***

	Killed.			Injured.		
	1913	1914	1915	1913	1914	1915
Accidents by causes:						
Haulage system (cars, motors, etc.)	5	3	10	386	495	529
Railway cars or locomotives	5	7	2	75	111	61
Crushers	.....	.....	1	19	13	19
Cranes	4	.....	2	68	55	58
Blowers	.....	.....	.....	2	3	4
Other machinery	8	3	4	232	234	267
Falls of persons	10	6	3	364	620	499
Suffocation in ore bins	1	2	1	13	1	8
Flying or falling objects (rocks, timber, etc.)	3	1	1	603	1,052	914
Gas (burning or asphyxiation)	.....	.....	3	18	59	68
Scalding (steam or water)	.....	1	2	45	62	46
Electricity	2	2	4	57	49	46
Hand tools	.....	.....	.....	423	586	633
Nails, splinters, etc	.....	.....	.....	79	96	146
Furnace slips	.....	.....	.....	17	8	29
Burns from matte, slag, or molten metal (pouring or spilling)	4	2	3	777	959	894
Hot-metal explosions	2	.....	1	148	162	160
Other causes	3	6	1	921	1,108	1,337
Total number killed or injured	**47**	**33**	**38**	**4,247**	**5,673**	**5,718**
Accidents by States:						
Arizona	15	3	7	805	553	574
California	2	1	.....	144	163	163
Colorado	1	2	6	295	636	404
Illinois	2	3	2	271	697	782
Kansas	.....	.....	1	63	89	408
Missouri	.....	.....	3	353	257	304
Montana	4	6	6	390	538	457
Nevada	5	1	.....	128	33	58
New Jersey	2	3	4	200	622	630
New York	1	1	(a)	15	49	(a)
Oklahoma	3	1	1	121	97	262
Pennsylvania	.....	1	2	251	205	339
Tennessee	.....	1	1	372	326	249
Utah	10	5	3	554	605	437
West Virginia	1	.....	1	86	61	106
Other States [b]	1	5	1	199	742	545
Total number killed or injured	**47**	**33**	**38**	**4,247**	**5,673**	**5,718**
Number killed or injured per 1,000 employees:						
Smelting plants	**2.29**	**1.19**	**1.21**	**206.53**	**203.12**	**182.53**
Ore-dressing plants	**1.07**	**1.52**	**1.62**	**131.93**	**96.71**	**112.85**
Coke ovens	1.89	2.02	1.22	103.27	98.10	91.82
Quarries	1.72	2.05	.....	72.83	89.11	.....
Metal mines (surface only)	2.08	1.65	.....	114.72	110.08	.....
Metal mines (total)	3.57	3.54	.....	172.37	191.10	.....
Coal mines (total)	3.72	3.22	3.09	.....	.....	.....

[a] No reports received.
[b] Includes Indiana, Michigan, New Mexico, Texas, Virginia, Washington, and Wisconsin.

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TABLE 12.—*Number of men employed, number of days worked, and number of men killed and injured at* ***smelting plants*** *in the United States, in the calendar year* ***1914.***

State.	Number of employees.	Total days worked.	Average days active.	Number killed.		Number seriously injured.[a]		Number slightly injured.[b]		Widows.	Orphans.
				Total.	Per 1,000 employed.	Total.	Per 1,000 employed.	Total.	Per 1,000 employed.		
Arizona	2,491	875,543	351	3	1.20	136	54.60	417	167.40	3	2
California	917	314,162	343	1	1.09	44	47.98	119	129.77	.....	.....
Colorado	2,810	1,006,670	358	2	.71	126	44.84	510	181.49	1	3
Illinois	3,228	1,167,544	362	3	.93	73	22.61	624	193.31	1	2
Kansas	942	337,890	359	.....	.....	11	11.68	78	82.80	.....	.....
Missouri	980	353,126	360	.....	.....	20	20.41	237	241.84	.....	.....
Montana	2,508	792,731	316	6	2.39	62	24.72	476	189.79	4	8
Nevada	726	253,006	348	1	1.38	8	11.02	25	34.44	1	6
New Jersey	3,567	1,214,362	340	3	.84	131	36.73	491	137.65	2	5
New York	210	64,500	307	1	4.76	3	14.29	46	219.05	1	3
Oklahoma	1,210	424,145	351	1	.83	14	11.57	83	68.60	1	.....
Pennsylvania	1,279	452,803	354	1	.78	9	7.04	196	153.24	1	2
Tennessee	299	105,229	352	1	3.34	51	170.57	275	919.73	.....	.....
Utah	2,779	1,013,095	365	5	1.80	161	57.93	444	159.77	4	2
West Virginia	826	294,015	356	.....	.....	14	16.95	47	56.90	.....	.....
Other States[c]	3,107	1,031,948	332	5	1.61	152	48.92	590	189.89	3	3
Total, 1914	**27,879**	**9,700,769**	**349**	**33**	**1.19**	**1,015**	**36.40**	**4,658**	**166.72**	**22**	**36**

[a] Time lost, 20 days or more. [b] Time lost, 1 to 19 days, inclusive. [c] Includes Indiana, Michigan, Nebraska, Ohio, Texas, Virginia, Washington, and Wisconsin.

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ACCIDENTS AT COPPER METALLURGICAL PLANTS.

As the mills and smelters treating copper ores represent such an important part of the metallurgical industry of the United States, Tables 13 and 14 have been compiled from the reports of a number of selected companies whose records appear reasonably complete, and where efforts are being exerted to maintain safety organizations. These figures represent 16 ore-dressing plants and 20 smelters in various parts of the country, employing 8,056 men at mills and 9,417 at smelters. The fatality rate at these plants is reasonably low and the nonfatal injury ratios are seemingly not much in excess of those at quarries and the surface plants of mines. These figures are given in order that more specific information may be available concerning this important branch of the metallurgical industry.

TABLE 13.—*Summary of accident data at copper metallurgical plants, 1915.*

	Mills.	Smelters.		Mills.	Smelters.
Number of plants	16	20	Number injured	1,009	1,686
Men employed	8,056	9,417	Fatality rate per 1,000, 300-day workers	1.13	1.43
Number of 300-day workers	8,838	10,438	Injury rate per 1,000, 300-day workers	113.03	161.52
Total days' labor (shifts)	2,651,313	3,131,577			
Days worked during year	329	332			
Number killed	10	15			

TABLE 14.—*Accidents, by causes, at copper metallurgical plants, 1915.*

Cause.	Mills.		Smelters.	
	Killed.	Injured.	Killed.	Injured.
Haulage system (cars, motors, etc.)	1	51	3	150
Railway cars and locomotives	.....	9	.....	12
Crushers	.....	6	.....	3
Rolls or stamps	.....	10	.....	.....
Tables, jigs, etc	.....	32	.....	.....
Cranes	.....	.....	2	23
Other machinery	1	103	2	110
Falls of persons	3	146	2	167
Suffocation in ore bins	1	2	1	7
Falling objects (rocks, timbers, etc.)	1	111	1	316
Cyanide or other poisoning	.....	5	.....	.....
Gas (burning or asphyxiation)	.....	.....	.....	2
Scalding (steam or water)	.....	7	.....	17
Electricity	1	19	1	24
Hand tools, axes, bars, etc	.....	133	.....	219
Nails, splinters, etc	.....	57	.....	49
Flying pieces of rock from sledge or crusher	.....	40	.....	.....
Burns from matte, slag, or molten metal	.....	.....	2	201
Hot-metal explosions	.....	.....	1	53
Other causes	2	278	.....	333
Total	10	1,009	15	1,686

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